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ABSTRACT

The relationships between school accreditation variables, socioeconomic status, and student achievement were investigated from standardized reading and mathematics achievement test scores in 38 eighth grade and 74 fifth grade schools. The percentage of children eating a free lunch at school was used to indicate socioeconomic background. School accreditation variables included the number of library books per student, total expenditure per student, number of teacher aides and support staff members per student, number of students per full-time teacher, average level of certification for teachers, expenditiures for instructional supplies per student, expenditures for libraries per student, level of state certification, Southern Association of Colleges and Schools accreditation, number of square feet of classroom space per student, and the average number of pupils in a grade. Canonical correlation and multiple regression analysis revealed that the socioeconomic status of students had a major impact on the variance in reading and mathematics achievement, and that traditional school accreditation practices were associated with a difference in mathematics achievement, and to a lesser degree in reading. When socioeconomic status was not considered, the accreditation variables which accounted for variance in achievement test scores were student-teacher ratio, level of teacher certification, and expenditure for library books per student. (Author/JAC)

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The Relationship Between Student Achievement and Accreditation Variables Associated with the Student's School

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THE PROBLEM

Becoming accountable means that a school system must constantly work to improve all of its educational offerings. One method by which a school system continuously becomes accountable is the traditional accreditation self-study. An accreditation agency, such as the Southern Association of Colleges and Schools or a state department of education, usually identifies several variables which will be investigated within a school system. Many times these variables have specific levels or standards which must be reached in order to receive a certain level of accreditation. Frequently the assumption is that, once these standards have been met in the programs and facilities of the schools, student learning will be adequately fostered.

Recently, however, legislatures in several states (Gubser, 1973; Houston and Howsam, 1974; Bennett, 1974; Porter, 1973) have begun to search for school accountability in terms of student achievement as measured by standardized tests. One factor contributing to this action by state government bodies appears to be an erosion of the belief that accreditation leads to accountability. Accountability models submitted for schools by legislative bodies often do not take into account the influence of extraneous variables such as the socio-economic backgrounds of students when achievement is considered. While schools have little control over the socio-economic status of their students, this factor accounts for a large negative portion of the variance in achievement test scores (Rogers and Bullock, 1973; Jantz, 1974). Critics of accountability plans utilizing student achievement as measured by standardized tests point out that it is hardly fair to compare the academic progress of students in schools located in low-income neighborhoods with that of students in schools serving middle class population (Coleman, 1975).

The study reported herein was conducted to explore further the problem surrounding accountability by placing in proper perspective the influence of certain variables on a school district's ability to become accountable for its program offerings and the achievement of its students.

THE QUESTIONS

The following questions were investigated by this study:

(1) What relationship does the socio-economic status of the students have on their achievement in reading and mathematics?

(2) What relationship does the school accreditation variables have on student achievement in reading and mathematics when the socio-economic status of students was controlled?

(3) What relationship does the school accreditation variables have on student achievement in reading and mathematics when the socio-economic status of students was not controlled?

DEFINITION OF VARIABLES

Two dependent variables, mathematics achievement test scores (M) and reading achievement test scores (R) were utilized in the study. The scores were derived from the results of the California Achievement Test, 1970 edition (CAT-70). These variables were collected from level 2 of this instrument for fifth grade schools and level 3 for eighth grade schools.

One socio-economic independent variable was considered: the percentage of children eating a free lunch at school (FL). This measure gave some idea of the relative socio-economic levels of the schools being studied. The other independent variables examined were accreditation variables. In these

variables, the average number of students in daily attendance (ADA) was utilized.

These accreditation variables were: (a) the number of library books per ADA (LB); (b) total expenditure per ADA (TMON); (c) ADA per teacher aide (IS); (d) ADA per supportive service staff member (SS); (e) ADA per full-time equivalent teacher (ET); (f) average level of certification for teachers in the school (LC); (g) expenditures for instructional supplies per ADA (IMON); (h) expenditures for libraries per ADA (LMON); (i) level of state certification (A1); (j) Southern Association of Colleges and Schools accreditation (A2); (k) the number of square feet of classroom space per ADA (SQ); (l) the average number of pupils in a grade in a school (GS).

SUBJECTS AND DATA COLLECTION

The subjects for this study were 38 eighth grade schools or attendance centers and 74 fifth grade schools. All the schools were associated with school districts that held membership in the Program of Research and Evaluation for Public Schools (PREPS). PREPS is a consortium of 14 public school districts that work through Mississippi State University to obtain assistance in research and evaluation. All the attendance centers that had reading and mathematics achievement scores from the CAT-70 were included in the study. Although the test scores utilized were only from the fifth and eighth grades, data related to the independent variables were collected for all the grades housed in the same attendance centers with the two target grades. This action was taken since it was assumed that students in one grade would be affected by the total school environment. All data were collected by local school district personnel and were submitted to the PREPS staff for analysis.

ANALYSIS OF THE DATA

Canonical Correlation

The first analysis conducted was a canonical correlation for data collected for the eighth grade schools as indicated in Table 1. The analysis identified only one significant root at $\alpha = .05/2$. The correlations indicate that the socio-economic variable of the percentage of children eating free lunches at school had the highest correlation. The socio-economic variable FL was removed from the study to see what the outcome would be. It was determined that no significant root was identified as shown in Table 2. Even though no significant root was identified, all the variables with the highest correlations in Table 1 also had the highest correlations in Table 2 with the exception of FL.

Next, a canonical correlation was conducted on data for the fifth grade schools. Again, one significant root was identified as shown in Table 3. The socio-economic variable FL had the greatest correlation. The socio-economic variable FL was removed and the canonical correlation was run again. This time one significant root was found again at $\alpha = .05/2$ as shown in Table 4. As in the analysis on the eighth grade study, all the variables noted in Table 3 were also identified as having the largest correlations, with the exception of the percentage of children eating a free lunch at the school.

The only major difference in variables identified between the fifth grade analysis and the eighth grade analysis was that the level of certification of the teachers in the school and the number of library books per student in ADA were identified only in the eighth grade analysis, and the amount of money spent on instructional supplies per student in ADA was found significant only for the fifth grade. The other significant variables were common to both grades. However, the major points to be gained from

Table 1

Canonical Correlation for 8th Grade with SES Variable

	1	2
Roots	.7893	.3821
CHI SQ	47.5040*	14.6826

* Significant at α = .05/2

	Simple R
FL	-.9093
TMON	-.5940
LC	.5482
ET	.6572
LB	.4522
GS	.4295
LMON	.3585

Table 2

Canonical Correlation for 8th Grade without SES Variable

	1	2
Roots	.5995	.3590
CHI SQ	28.3631*	13.7867

* Significant at $\alpha = .05/2$

	Simple R
TMON	-.7154
ET	.7752
LC	.5991
GS	.4537
LB	.4504
LMON	.3675

Table 3

Canonical Correlation for 5th Grade with SES Variable

	1	2
Roots	.7994	.2206
CHI SQ	106.0372*	16.4476

* Significant at $\alpha = .05/2$

	Simple R
FL	-.9870
LMON	.5596
ET	.4785
IMON	.4405
TMON	-.3880
GS	.3231

Table 4

Canonical Correlation for 5th Grade without SES Variable

	1	2
Roots	.5603	.1679
CHI SQ	54.6345*	12.2234

* Significant at = .05/2

	Simple R
LMON	.6954
IMON	.5561
TMON	-.4785
ET	.5298
GS	.4031

this analysis are that only one significant canonical factor was isolated for the test data gathered from the fifth and eighth grades, and that the socio-economic variable of percentage of children eating free lunch was the most important variable associated with this factor at each grade level.

Multiple Regression

Next, a multiple regression was utilized to study relationships with each achievement area at each grade level. The first analysis investigated reading achievement at the fifth grade level as the dependent variable against all the independent variables defined earlier. The only variable which entered the equation at a significant level was the socio-economic variable FL as indicated in Table 5. This one variable accounted for 75.5% of all the variance in the test scores.

To obtain more information on the relationship of achievement in reading and traditional accreditation variables, FL was dropped from the analysis and the regression was recomputed. This time the amount of money spent on libraries per child in ADA, the student-teacher ratio, the level of certification of teachers in the school building, and the average number of square feet of classroom space per student in ADA entered the equation at a significant level as shown in Table 6. However, this equation explained only 50.3% of the total variance in test scores.

The regression investigating the relationship of the dependent variable of mathematics achievement in the fifth grade with the independent accreditation variables revealed in Table 7 that only the socio-economic variable FL and the regional accreditation variable entered at a significant level. This equation accounted for 65% of the variance in the test scores.

To gain more information about the relationship of accreditation variables, the regression was run again after dropping the free lunch variable from

Table 5

Multiple Regression for Reading at 5th Grade with SES Variable

Variable	Multiple R	R^2	R^2 added	Simple R	F
FL	.86892	.75503	.75503	-.86892	218.832*

* Significant at α = .05/2

Table 6

Multiple Regression for Reading at 5th Grade without SES Variable

Variable	Multiple R	R^2	R^2 added	Simple R	F
LMON	.51978	.27018	.27018	.51978	32.969*
ET	.61060	.37284	.10266	.41579	18.716*
LC	.68401	.46788	.09504	.16332	14.174*
SQ	.70946	.50334	.03546	.07216	4.856*

* Significant at $\alpha = .05/2$

Table 7

Multiple Regression for Mathematics at 5th Grade with SES Variable

Variable	Multiple R	R^2	R^2 added	Simple R	F
FL	.78898	.62091	.62091	-.78798	129.021*
A1	.80606	.64973	.02882	-.06432	5.760*

* Significant at $\alpha = .05/2$

Table 8

Multiple Regression for Mathematics at 5th Grade without SES Variable

Variable	Multiple R	R^2	R^2 added	Simple R	F
ET	.41822	.17491	.17491	.41822	12.595*
LMON	.51299	.26316	.08826	.37307	11.332*
LC	.55259	.30535	.04219	.09953	4.191*

* Significant at α = .05/2

the prediction equation as indicated in Table 8. The analysis revealed influence of the following three significant variables; the student-teacher ratio, the amount of money spent on libraries per student in ADA, and the level of certification of teachers in a schools. This analysis explained only 30.5% of the total variance.

The same analyses were conducted on the eighth grade data. The regression investigated the relationship of accreditation variables with the dependent variable of reading achievement at the eighth grade level. The analysis, as indicated in Table 9, revealed the following variables entering at a significant level; FL, the average number of square feet of classroom space per student in ADA, the number of library books per student in ADA, the level of state certification, and the average size of a grade housed at the school. This analysis explained 74.5% of the total variance, with the socio-economic variable FL accounting for 62.9% of the variance.

To provide a better view of the relationship of the accreditation variables to reading achievement in the eighth grade, the socio-economic variable FL was dropped from the analysis. The variables of teacher-student ratio, level of certification of teachers, and level of state accreditation of schools entered the equation at a significant level as indicated in Table 10. This equation could explain only 50.5% of the total variance.

Finally, the dependent variable of mathematics achievement in the eighth grade was examined using a multiple regression with the independent accreditation variables listed earlier. This equation demonstrated that only the variables of free lunch participation and Southern Association of Colleges and Schools Accreditation entered the equation at a significant level as indicated in Table 11. This equation explained 72.1% of the total variance.

Table 9

Multiple Regression for Reading at 8th Grade with SES Variable

Variable	Multiple R	R^2	R added	Simple R	F
FL	.79332	.62936	.62936	-.79332	57.748*
SQ	.82360	.67832	.04896	-.20454	4.700*
LB	.83568	.69837	.02005	.42736	6.371*
A2	.84892	.72067	.02230	-.08577	4.060*
GS	.86381	.74617	.02551	.39238	3.216*

* Significant at α = .05/2

Table 10

Multiple Regression for Reading at the 8th Grade without SES Variable

Variable	Multiple R	R^2	R added	Simple R	F
ET	.55790	.31125	.31125	.55790	14.881*
LC	.66674	.44455	.13329	.49020	11.738*
A2	.71077	.50519	.06065	-.08577	4.167*

* Significant at α = .05/2

Table 11

Multiple Regression for Mathematics at 8th Grade with SES Variable

Variable	Multiple R	R^2	R added	Simple R	F
FL	.78999	.62408	.62408	-.78999	87.745*
Al	.84910	.72097	.09689	-.14645	12.154*

* Significant at α = .05/2

To study the relationship of accreditation variables to the dependent variable of mathematics achievement in the eighth grade, the free lunch variable was dropped. The new regression found three predictor variables entering the equation at a significant level as indicated in Table 12: student-teacher ratio, level of certification of teachers in the school, and level of state accreditation. This equation explained 51.3% of the total variance.

DISCUSSION & IMPLICATIONS

Related to the question of what effect the socio-economic status of the students have on their achievement in reading and mathematics, it was found in this study that the socio-economic status of children makes a major impact on explaining the variance in achievement test scores. Data in this study indicated that the higher the socio-economic status of children, the higher their achievement. This information tends to lead one to conclude that socio-economic status of children must be considered as a covariant in any model of student achievement used to determine the "accountability" of a school.

What effect did the school accreditation variables have on student achievement in reading and mathematics when the socio-economic status of students was controlled? It was discovered that for mathematics achievement at both the fifth and eighth grade levels after the socio-economic status of students entered the equation, the only other variable to enter the equation at the .05 level of significance was the level of state certification. For reading achievement at the fifth grade level after socio-economic status of the children was controlled, the level of state accreditation was the only variable to enter the equation at the .05 level of significance. For the eighth grade reading achievement after the socio-economic variance was

Table 12

Multiple Regression for Mathematics at 8th Grade without SES Variable

Variable	Multiple R	R^2	R added	Simple R	F
ET	.59990	.35988	.35988	.59990	18.658*
LC	.67862	.46052	.10065	.45405	9.200*
A2	.71646	.51331	.05278	-.07626	3.687*

* Significant at α = .05/2

controlled, the fact that the district had accreditation with the Southern Association of Colleges and Schools entered the equation with three other variables. For the fifth grade reading achievement after the socio-economic variance was controlled, no other variable entered the equation at the .05 level of significance. Therefore, every time an additional variable entered the equation for predicting student achievement after socio-economic variance was controlled, a measure of accreditation was entered as a significant variable.

What effect did the school accreditation variables have on student achievement in reading and mathematics when the socio-economic status of students was not controlled? Failing to control for the socio-economic status of students allowed a totally new picture to appear in the relationship among variables. The school accreditation variables only proved significant in one of the possible four regression models, reading achievement for eighth grade students. Instead of the variance in mathematics achievement being associated with the socio-economic status of students and the level of state accreditation, the student-teacher ratio, the amount of money spent on library books per student, and the level of certification of the teachers in a school explained the variance in student achievement. The reading achievement at the fifth grade had the same variables as the mathematics achievement equation with the addition of the variable of number of square feet of classroom space per student. The eighth grade reading achievement equation matched the mathematics achievement equation with the substitution of the level of state accreditation for library expenditures. In every situation where the socio-economic status of students was not considered, the resulting equation explained less variance in the achievement test scores than when it was considered.

Three major implications were supported by data from this study.

(1) The socio-economic status of students has a major impact on explaining the variance which occurs in achievement test scores for reading and mathematics. This would suggest that a proper picture of a school district could not be developed from achievement test score data unless the socio-economic status of the students is addressed in analysis of the data.

(2) There is some degree of support for the position that traditional school accreditation practices are associated with a difference in achievement test scores in mathematics, and to a lesser degree in reading. This would suggest that any move to establish an accountability plan for public schools should consider an important position for accreditation. It should be noted that the effectiveness of the accreditation process may not be all the standards which are met by a school district, but rather the self-study process which leads to internal change within a school system.

(3) When socio-economic status of students is not considered, the three traditional accreditation variables that accounted for variance in achievement test scores were student-teacher ratio, level of teacher certification, and expenditures for library books per student. The student-teacher ratio correlated positively with achievement, indicating the larger the ratio, the more achievement demonstrated. It should be considered, however, that this variable is actually a monetary variable and may reflect the large amounts of federal dollars which are spent in districts that have a high percentage of students with a low socio-economic status. These federal dollars are usually spend for faculty. Therefore, this variable may have functioned as FL did when the socio-economic status of students was statistically controlled. This phenomenon appears to suggest that even though a better learning situation is established for low socio-economic students, it would be unrealistic

to expect to see a direct positive increase in achievement when these students are compared to the entire population of students. This conclusion does not mean, however, that creating a better learning situation for low socio-economic students is an unjustified action.

The level of teacher certification in a school was positively related to achievement in the two areas. From this finding it could be concluded that the more education the teachers had received, on the average, the better the students of this teacher will learn. However, it must be mentioned that the teachers with higher levels of certification tend to gravitate to districts which pay higher salaries. These higher paying districts would usually have a higher socio-economic status than the average school, thus bringing back into consideration the power of the socio-economic variable. Nevertheless, it is not suggested here that all of the effects of the level of certification variable were due to socio-economic factors.

Finally, the variables of expenditures for library books was positively related to achievement. No doubt, the presence of learning materials such as library books and other aids in a library do have an effect on achievement. Again, one can see how this variable is associated with the socio-economic status of a district, since less affluent districts tend to spend their money on personnel while districts with more financial resources already have personnel and spend extra money on instructional aids such as library books. This situation may not imply that library books and other learning aids are effective tools in improving achievement, only that more affluent school districts tend to have a better supply of these aids because of the manner in which they make decisions on priorities for expenditures.

Results of this study indicate that as legislators and school personnel seek to implement accountability plans, it should be remembered that there is

a positive relationship between the level of accreditation and achievement test scores in reading and mathematics after the variance associated with the socio-economic status of the students are removed. One possible occurrence could be that teachers are learning much more about their curriculum through the self-study which traditionally accompanies the accreditation process which would lead to a more effective change process since decisions would be made at the local school level. This possibility may suggest that as accountability plans are created to effect positive change in student achievement, serious consideration should be given to achieving these goals by working to change the traditional accreditation process while keeping its strong points such as the self-study process.

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